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LAMINITIS.

Its Nomenclature, Nature, Etiology, Symptoms, Course,
Complications and Treatment.

A

CONTRIBUTION

TO

VETERINARY PATHOLOGY.

BY

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NOTE FROM THE AUTHOR.

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THE researches which I have made during the past two years, into the pathology of Laminitis, have brought me to conclusions, in part so much at variance with those set forth in the text-books which I have seen, that I am prompted to give the profession my views on the subject in this monogram.

I have treated of the disease *in extenso*, in that the prophylactic, as well as remedial, treatment might be fully understood, hoping thereby to prevent avoidable suffering, too often the result of mistaken kindness, and to relieve that already induced.

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LAMINITIS.

NOMENCLATURE.

By what term this disease was first known to man is a question unanswerable. During many years in the recent past, and before an approximate knowledge of its lesions was had, it was usually designated as "Founder."

In country districts, and amongst the great majority of the laity, this name is yet almost exclusively used, and, undoubtedly, it was first so employed because of its conveyed expressiveness of the physical inability, or disinclination, upon the part of the patient to proceed in his gait, resembling thereby a ship similarly disabled. That it could have been adopted upon any other ground, hardly seems possible, for the etymology of the term does not indicate that it was so used because it contained even the most remote intimation, either as to the seat of the disease, its nature, or its cause.

Webster, in his Dictionary, gives as one of the definitions to the term : "To trip ; to fall ; to stumble and go lame." This definition is very truly descriptive of the most notable symptoms of the disease, and particularly so of the chronic form ; but it does not serve in the least to distinguish between any of the many diseases which cause tripping, stumbling and lameness—objections which are fatal to its employment in a scientific sense.

Since the days of Youatt, when symptomatology exercised so important an influence in the naming of all diseases, this term has gradually given way to the more modern "Lamin-

itis," which now finds recognition in all the text-books on veterinary surgery.

But while this last and generally accepted term is an expressive one, based on an anatomico-pathological knowledge of the disease, it is not strictly correct ; for it leaves the impression that *either* or *both* sets of the laminæ might be the seat of inflammation—an impossibility upon the part of the horny tissue. Furthermore, it conveys the idea that *only* the laminæ are affected, whereas in many instances the velvety tissue is also implicated—not as a complication, but as a part of the primary disease.

A better term would be found in Podophyllitis; for this would designate the sensitive laminæ, or podophyllous tissue, as the seat of the disease. Yet the same objection is applicable here as in the case of laminitis, regarding the exclusion of the velvety tissue.

The name coming nearest perfection in its comprehensiveness, if our knowledge of the pathology of the disease is correct, would be "Keratitis;" for it could rightfully be employed to designate inflammation of all, or any part of the keratogenous membrane. But, laying aside our objections to the defects in the adopted term of Laminitis, and accepting it broadly as meaning inflammation of the sensitive laminæ and velvety tissues of the foot, it is still very generally misused by the profession in describing simple congestion of the keratogenous membrane.

So also does it seem to me an error to apply this term to that occasional condition where Ostitis and Periostitis of the pedal bone, are of far more importance than the accompanying Laminitis. It is probably true that in nearly all these cases inflammation of the laminæ precedes that of the other tissues ; for, because of their different anatomical structure, bone and periosteum are much more slow to respond to irritation than are the laminæ ; yet, since the producing or *exciting* cause is one and the same in all these complications, and since the disease of the bone and its covering, are much the more serious, it would seem that we might do better did we accept Williams' suggestion and call these mixed cases "Peditis."

NATURE.

Of the nature of Laminitis but little is to be said ; it being a simple non-specific, non-contagious, and non-infectious inflammation, characterized by the general phenomena attending inflammation of the skin and mucous membranes, producing no constitutional disturbances, except those dependent upon the local disease ; and having a strong tendency, in severe cases, to destructive disorganization of the tissues affected.

ETIOLOGY.

The causes of Laminitis are as wide and variable as in any of the local inflammations, and may be divided into two classes : the predisposing and exciting.

Predisposing Causes.

From personal observations I do not know that any particular construction of foot, or any special breed of horses are thereby predisposed to this disease ; neither can I find anything to warrant the assumption that it is in any way hereditary ; so that while we may easily cultivate a predisposition to the disease upon the part of the tissues subject to become affected, the disease itself does not originate without an exciting cause. Like most other tissues, a predisposition to inflammation may be induced in the sensitive laminæ by any cause which lessens their power of withstanding the work imposed on them. It exists, to an extent, in those animals unaccustomed to work, particularly if they are plethoric, and in all those that have been previous subjects of the disease—for the same rule holds good here that we find in so many diseases—*i. e.*, that one attack impairs the functional activity of the affected tissues, and thus renders them more easy of a subsequent inflammation.

Unusual excitement, by determining an excessive blood supply ; bad shoeing ; careless paring of the feet by removing the sole support, as well as high calkings without corresponding toe-pieces, must be included under this head.

Exciting Causes.

The exciting causes of Laminitis are many and varied ; the most common being concussion, over-exertion, exhaustion, rapid changes of temperature, ingestion of various foods, purgatives, and the oft-mentioned metastasis. In conjunction with these Williams would add : "Excitement, bad shoeing, paring of the feet, tight nailing of the shoes, and high calkings." I do not believe these influences can rightly be classed with the exciting causes, but have placed them under the head of predisposing causes.

1. Concussion acts as a producer of this disease by the local over-stimulation which it occasions—the excessive excitement being followed by an almost complete exhaustion of the functional activity of the keraphyllous tissue ; the exhaustion by congestion, and eventually by inflammation. But congestion here, as in all other tissues, is not necessarily always followed by inflammation ; for although the principal symptoms belonging to true Laminitis are present, the congestion may be relieved before the processes of inflammation are fully established.

This is the condition that obtains in the many so-called cases of Laminitis which recover in from twenty-four to forty-eight hours' time. These are the cases which should be called Congestion of the Laminæ, or Congestion of the Keratogenous Membrane; for there is, in truth, no inflammation present, and the profession seems to have forgotten, or overlooked, the fact that simple congestion here was a possibility.

Laminitis from concussion, is common in track-horses trotting races when not in condition, especially if they are carrying the obnoxious toe-weights ; and in green horses put to work on city pavements, to which they are unaccustomed. Concussion from long drives on dirt-roads, is at times productive of the same results ; notably when the weather is extremely warm, or at least when the relative change of temperature is great. But undoubtedly the exhaustion so apt to be produced under these circumstances, must be considered as exerting almost as great an influence as an exciting cause, as does the long-con-

tinued concussion. This same combination of causes must also be admitted as determining the disease when seen at times in hunters ; for the imposed weight of the rider increases the demands made upon the function of these tissues, and their powers of resisting congestion and its consequences, are the sooner exhausted.

2. Over-exertion—as heavy pulling or rapid work, even where there is no chance for immoderate concussion, occasionally results in this disease; although in the majority of instances exhaustion is a conjunctive cause, for over-exertion cannot be long continued without inducing this condition.

3. Exhaustion, in whatever manner produced, is nearly as prolific a source of Laminitis as is concussion ; for when the physical strength has been greatly impaired, even though but temporarily, some part of the economy is rendered more vulnerable to disease than others, and it is not strange that, in many instances, it should be those parts still called upon to perform their function of maintaining the weight of the body after their activity has been exhausted. It is to this cause we must ascribe those many cases which we see following a hard day's work, where at no time has there been over-exertion or immoderate concussion.

In the same manner a strong tendency to Laminitis is induced in horses on sea-voyages ; the exhaustion of the laminæ resulting from the continual constrained position which the animal is compelled to maintain on account of the rocking-motion of the vessel.

The same cause exists where one foot has been blistered, or where one limb is incapacitated from some other reason ; for the opposite member, being called on to do double duty, soon becomes exhausted, and congestion, followed by inflammation results as a matter of course. Where one foot only becomes Lamanitic it is customary to find the other, or corresponding member, participating at a later date ; not always, as we are told, because of sympathy, but because the transfer of all the functional performance to the one foot, proves within itself a sufficient exciting cause.

4. Rapid changes of temperature act as an exciting cause of Laminitis, in precisely the same way as they act to produce disease in other tissues—the result of these variations of temperature showing itself upon those parts rendered particularly susceptible to pathological changes from some impairment of their natural disease-resisting powers.

This change of temperature may be induced by drinking large quantities of cold water while in an over-heated condition. Here the internal heat is rapidly reduced, the neighboring tissues and blood-vessels constricted, and the blood supply to these organs greatly diminished ; while the quantity sent to the periphery is correspondingly increased. True, in many of the cases which result from this cause, there has not been sufficient labor performed to impair the powers of the laminæ, and I am inclined to the opinion that Laminitis is the more readily induced, than congestion or inflammation of the skin or other peripheral organs, because of the impossibility upon the part of the laminæ to relieve themselves of the threatened congestion by the general safety-valve of perspiration.

A cold wind, or relatively cold air allowed to play upon the body when heated and wet with sweat, has virtually the same result ; for it arrests evaporation, and rapidly cools the external surface, thereby determining an afflux of blood to such organs and tissues as are protected from this outside influence. In many instances this happens to be some of the internal organs, as the lungs, where the previous work has been rapid and their functional activity impaired ; but in numerous other instances the determination is toward the feet, and that it *is* so, depends upon two very palpable facts—*first* : that these tissues have been greatly excited, and are already receiving as much blood as they can, consistently with health, accommodate ; *secondly* : even though these tissues are classed with the peripheral ones, their protection from atmospheric influences by means of the thick box of horn encasing them, renders them, in this respect, equivalent to internal organs.

Again : a still more limited local action of cold excites this disease, as seen from driving through water, or washing the feet or legs while the animal is warm, or just in from work ;

here a very marked reaction takes place in the peripheral tissues of the limbs, and passive congestion of the foot results from the interference with the return flow of blood being sent to the organs in excess. These are more apt to be simple cases of congestion, soon to recover; yet they may become true cases of Laminitis. Youatt says: "The danger is not confined to the change from heat to cold; a sudden transition from cold to heat is as injurious, and therefore it is that so many horses after having been ridden far in frost and snow, and placed immediately in a hot stable, and littered up to the knees, are attacked by this complaint." I have never seen the disease occur under exactly similar circumstances, but am inclined to believe, that in these cases, the disease was attributed to the *wrong* cause—the excitement, exhaustion, and concussion of the long ride being, apparently, entirely overlooked. Furthermore, if we consider the physical conditions which must necessarily be present under the circumstances, it seems inconsistent with our knowledge of the effects of heat and cold, to believe the very moderate temperature of stables, and the heat-producing properties of bedding "up to the knees," could be productive of Laminitis.

Rather should we say that such favorable circumstances would be conducive to opposite results.

5. Why it is that certain kinds of grain will cause Laminitis, does not seem to be clearly understood. Certainly they possess no *specific* action upon the laminæ, for all animals are not alike affected; neither do they always produce these results in the same animal. In the case of some of these aliments, where their ingestion causes a strong tendency to indigestion, the consequent irritation of the alimentary canal may be so great as to warrant the belief that the laminæ are affected through sympathy. In other instances there is no apparent interference with digestion, nor evidence of any irritations of the mucous membranes; yet the disease is, in some manner, dependent upon the food in question for its inception. Barley, Wheat, and sometimes Corn, are the grains most prolific in the production of this disease. With some horses there appears to be a particular susceptibility to this influence of Corn. In such in-

stances the feeding of this grain for a few days will be followed by inflammation of the feet lasting from a few days to two weeks' time. In these animals, to all appearances healthy, the corn neither induces colic, indigestion nor purging, and, apparently, no irritation whatever of the alimentary canal.

6. Fortunately purgative medicines but rarely become the exciting cause of inflammation of the laminæ. That it is then the result of a sympathetic action upon the part of the tissues affected, is, no doubt, more than hypothetical ; for when there is no derangement of the alimentary canal existing, a dose of cathartic medicine will, at times, bring on severe Laminitis, and that too before purgation commences.

Williams very ingeniously explains this sympathy of action by remarking that the skin, mucous structures and laminæ are continuous one with another, and secretory ; that their secretions are similar ; that irritation of one tends to spread to the others, and although so slight in the skin as hardly to be noticed, it becomes the source of an acute inflammation in the sensitive tissues of the laminæ surrounded as they are by unyielding structures. If this be the true explanation, it is remarkable that diseases of the skin are not accompanied by affections of the laminæ ; for they are more nearly related by contiguity, than are the mucous membranes and the laminæ. At the same time I am inclined to doubt the presence of skin disease as a cause for the slow healing of wounds during the course of Laminitis, as is claimed by Williams ; but rather would attribute such tendency to blood-changes.

7. Most, if not all, the older authorities were agreed that Metastatic Laminitis is a reality. That such a condition ever does exist outside the imagination certainly awaits the proving.

That Laminitis *may* and oftentimes *does* exist as a concurrent disease with numerous others, is unquestionably true ; but to believe an inflammation can be almost momentarily transferred from one organ to another, no matter how remote, is to destroy all belief in our knowledge of the pathology of this complicated process. We do not pretend to deny that the induc-

tion of Laminitis during the course of some other disease, may serve to arrest the further invasion of healthy tissue by the primary process, or that it may exert a remedial influence upon the first disease ; but it cannot and does not at once remove that inflammation and obliterate its lesions ; for the products of any inflammation, be it never so simple, require a certain time for their removal, and it is impossible that, for instance, the products of inflamed lung tissue can be immediately removed, and the inflammation in whole transferred to the laminae. There is no manner of removing such inflammatory products, except by the natural means of the lymphatics and blood vessels, and even these very efficient absorbents are powerless to accomplish their functions until degenerative processes have rendered the products fluid. This liquification cannot be accomplished in the short time required for the development of Laminitis in these so-called metastatic cases ; and just so long as the products of the inflammation remain in the tissues in an unchanged form, just so long will you have the usual symptoms belonging to the disease. Furthermore, since no inflammation can exist without characteristic lesions being produced, neither can it be removed until the lesions have in some manner been repaired. Metastatic Laminitis then is nothing more nor less than concurrent Laminitis, and as such, presents little in anyway peculiar outside the imperfectly understood exciting cause ; and the practitioner who allows the acute symptoms of the Laminitis to mislead him, simply because their severity has overshadowed those of the primary disease, may lose his case through unguarded subsequent treatment. This form of Laminitis is by no means commonly met with, but when seen, will usually be found in conjunction with Pneumonia ; according to Youatt, with inflammation of the bowels and eyes, and according to Law and Williams, sometimes with Bronchitis.

SYMPTOMS.

Laminitis is characterized by a congregation of symptoms so well-marked as scarcely to be misinterpreted by the most casual observer. They are nearly constant in their manifes-

tations, modified by the number of feet affected, the cause which has induced the disease, the previous condition of the patient, and the various other influences which operate in all diseases to some extent. They may be divided into general symptoms—which are concomitants of all cases of the disease, subject to variations in degree only ; and special symptoms, or those which serve to determine the feet affected and the complications which may arise.

General Symptoms.

Usually the first symptom that would indicate any definite obstruction to functional performance, is the interference with locomotion produced by congestion of the keratogenous membrane. Occasionally, the other symptoms are presented first. With the development of the lameness the pulse will be found accelerated, full, hard and striking the finger strongly ; the temperature soon rises several degrees above the normal reaching, sometimes 106° F., although it generally ranges between $102\frac{1}{2}^{\circ}$ and 105° . The respirations are rapid and panting in character, the nostrils being widely dilated, and the mucous membranes highly injected. The facial expression is anxious and indicative of the most acute suffering, while the body is more or less bedewed with sweat. At first, there may be a tendency to diarrhoea, or it may appear later, particularly, as the result of medication. The urine is high colored, scant in quantity and of increased specific gravity, owing to the water from the system being eliminated by the skin instead of the kidneys. The appetite is impaired and sometimes entirely lost, while the thirst is greatly increased. The affected feet are hot and dry to the touch ; they are relieved as much as possible from bearing weight ; rapping them with a hammer, or compelling the animal to stand upon one affected member, causes intense pain, while the digital artery throbs beneath the finger.

Special Symptoms.

Liability to affection varies in the different feet according to the exciting cause. Any one, or more, of the feet may become the subject of this disease, although it appears more

often in the fore feet than in the hind ones,—a fact owing to the difference of function, *i. e.*, that the fore feet are the bases of the columns of support, receiving nearly all the body's weight during progression, and consequently most of the concussion ; while the hind feet at such times become simply the fulcra of the levers of progression, and are almost exempt from concussion.

ONE FOOT.--Injuries and excessive functional performance are the causes of the disease appearing in only one foot ; here the general symptoms, as a rule, are not severe, there often being no loss of appetite, and no unusual thirst, while the pulse temperature, and respirations remain about normal. In these instances the weight of the body is early thrown upon the opposite foot, and the diseased one is extended, repeatedly raised from the floor, and then carefully replaced. When made to move forward, the lame foot is either carried in the air while progression is accomplished by hopping with the healthy one, or else the heel of the first is placed on the ground and receives the little weight thrown upon it, while the sound limb is quickly advanced. Progression in a straight line is much more easily accomplished, than is turning toward the lame side.

BOTH FORE FEET.--When both fore feet are affected, the symptoms are well marked. The lameness is excessive, and the animal almost immovable. When standing, the head hangs low down, or rests upon the manger as a means of support and to relieve the feet ; the fore feet are well extended so that the weight is thrown upon the heels, where the tissues are least sensitive, least inflamed, and most capable of relief from free effusion. The hind feet are brought forward beneath the body to receive as much weight as possible, thereby relieving the diseased ones. If progression is attempted, which rarely happens voluntarily during the first three or four days, it is accomplished with very great pain and lameness at the starting, which usually subsides to an extent after a few minutes exercise. During this exercise, if the animal happens to step upon a small stone, or other hard substance, he stumbles painfully onto the

other foot, and is excessively lame in the offended member for a number of steps, owing to the acute pain which pressure upon the sole causes in the tissues beneath. The manner of the progression is *pathognomonic* of the complaint. Sometimes the affected feet are simultaneously raised from the ground, (the hind ones meanwhile sustaining the weight), then advanced a short distance and carefully replaced, while at almost the same moment the hind ones are quickly shuffled forward near to the centre of gravitation.

In other instances one foot at a time is advanced and placed with the heel upon the ground in the same careful manner; all causes of concussion being carefully avoided. In attempting to back the animal, he is found to be almost stationary, simply swaying the body back on the haunches, and elevating the toes of the diseased feet, as they rest upon their heels. In attempting to turn him either to the right or left, he allows his head to be drawn to the one side to its full extent before moving, then makes his hind feet the axis around which the forward ones describe a shuffling circle.

In a majority of cases of Laminitis in the fore feet, the animal persists in standing until he is nearly recovered. In other cases he as persistently lies, standing only when necessity seems to compel it, and then for as short a time as possible. If the recumbent position is once assumed, the relief experienced from a removal of the weight of the body off the inflamed tissues, tempts the patient to seek it again, and so we often find him down a greater part of the time. But this is not true of all cases, for sometimes he will make the experiment, then cautiously guard against a repetition. Even in those cases of enforced recumbency, he oftentimes takes advantage of the first opportunity and gets upon his feet, doggedly remaining there until again laid upon his side by his attendants. How to explain this diversity of action I do not know, for theoretically the recumbent position is the only appropriate one, except when complications exist, and the one which should give the most comfort, yet it is rejected by very many patients, and no doubt for some good reason. It has been suggested as an explanation, that when the animal gets upon his feet after lying

for a time, the suffering is so greatly augmented, that the memory of this experience deters him from an attempted repetition. If this were true, the horse with the first attack of this disease, must necessarily make the experiment before knowing the after effects of lying down, yet many remain standing without even an attempt at gaining this experimental knowledge.

The most favored position of the animal when down, is on the broad-side, with the feet and legs extended. While in this position the general symptoms greatly subside ; the respirations and pulse become almost normal ; the temperature falls, and the perspiration dries. It is mostly with difficulty that he is made to rise, and when he attempts it, gets up rapidly and "all in a heap" as it were, shifting quickly from one foot to the other, until they become accustomed again to the weight thrown upon them. Occasionally a patient will get up like a cow, rising upon the hind feet first. Although enforced exercise relieves, to some extent, the soreness, it is but temporary, for, after a few minutes rest, it returns again with all its former severity.

BOTH HIND FEET.—When only both hind feet are affected, they are, while standing, maintained in the same position as when only the fore ones are the subjects of the disease ; but with an entirely different object in view. Instead of being here to receive weight, they are so advanced in that the heels may receive whatever weight is, from necessity, imposed on them ; the fore feet being, at the same time, placed well back beneath the body where they become the main supports ; the animal standing, as Williams describes it, "all of a heap."

Progression is even more difficult now than when the disease is confined to the anterior extremities. The fore feet are dubiously advanced a short distance, and the hind ones then brought forward with a kind of a kangaroo-hop, which results in an apparent loss of equilibrium, which the animal is a few moments in regaining. The general symptoms—or in other words, the degree of suffering—seem more severe in these cases, than where the disease affects the fore feet alone. The standing position is not often maintained, the patient seeking

relief in recumbency. This fact is easily understood, when we consider how cramped and unnatural is the position he assumes while standing ; and if it were maintained for any considerable length of time, would, no doubt, excite the disease in the fore-feet as explained by D'Arboval.

ALL FOUR FEET.—Laminitis of all four feet is but uncommonly met with. The author has seen but three such cases. In all these, the position assumed was nearly normal, all the feet being slightly advanced, and first one, then another, momentarily raised from the ground and carefully replaced ; this action being kept up almost continually during the time the animal remained standing. The suffering in these cases is most acute ; the appetite is lost, and although the patient lies most of the time, the temperature remains too high, the pulse and respirations are greatly accelerated, the body covered with sweat, and bed-sores are unpleasant accompaniments.

COURSE.

The course which Laminitis takes, varies greatly in different cases, being influenced more or less by the exciting cause, the animals previous condition, the acuteness of the attack and the subsequent treatment. The first symptoms rarely exhibit themselves while the animal is at his work, although we will occasionally see the gait impaired by stumbling, the body covered with a profuse sweat and the respiration become blowing in character, as premonitions of the oncoming disease.

But as a rule nothing is noted amiss with the animal until he has stood for some time after coming in from work, when, in attempting to move him, he is found very stiff. Like all congestions the early symptoms usually develop rapidly ; yet this is not always the case, for in some instances there appears to be no well-defined period of congestion, the disease seemingly commencing at a *point*, and gradually spreading until a large territory is involved in the morbid process.

Simple Congestion.

Those cases of simple congestion of the laminæ, which we erroneously call Laminitis, are rapidly developed ; the symp-

toms being but moderately severe, and from one to three days required for recovery.

There are no structural changes here, and but a moderate exudate which is rapidly reabsorbed, leaving the parts precisely in the same condition as they were previous to the attack. If the congestion has been excessive, a rupture of some of the capillaries will be found; a condition more apt to obtain where the animal is made to continue work after a development of symptoms has begun.

True the majority of these last described cases prove to be Laminitis *in fact*, yet at times the congestion will pass away, and the extravasated blood be absorbed without inflammation supervening to an extent sufficient to warrant us calling it Laminitis. The seat of greatest congestion will always be found in the neighborhood of the toe, because of the increased vascularity of that part; and although at times it is limited to the podophyllous tissue alone, any or all parts of the keratogenous membrane may be affected by the congestion, and followed finally by inflammation.

Acute.

In the acute form of Laminitis, the symptoms may all develop rapidly, or it may commence by the appearance of a little soreness of the feet during progression, which in twenty-four or forty-eight hours' time has passed into a well-marked case. This peculiarity of development is due to one of two causes—either the congestion is general but takes place slowly, or else it begins in one or more points and gradually spreads throughout the laminæ. These acute cases generally run their course in from a few days to two weeks, or more time. Usually a culmination of the symptoms is reached, if the patient is properly treated, in from three to five days; then evidences of recovery are discernible in favorable cases. The lameness improves, the other symptoms gradually subside, and eventually health is regained. It is in these cases that a strong tendency to disorganization of a destructive character exists, and hence it is we see so many recover imperfectly, with marked structural changes permanently remaining. The inflammatory exudate

is poured out into the keratogenous membrane, which we find swollen to the greatest degree compatible with its restricted capabilities. This exudate is rich in wandering cells, and according to Fleming, "a large quantity of hard consistent horn" is deposited on the surface of the inflamed tissues. The exudation is seen in greatest quantity at the toe where the vessels are most profuse, while occasionally extravasated blood is found on the inner surface or plates of the keraphyllous tissue. Purulent infiltration sometimes exists to a limited degree without any suppuration occurring. The rich plastic infiltration which has taken place, ends either in reabsorption, or, as it is prone to do, in the development of new connective tissue; while the serous exudate and extravasated blood are readily removed by the absorbents, and the new horn-material becomes organized and eventually removed by the off-growing hoof.

Sub-Acute.

Sub-Acute Laminitis is most often seen as a termination of the acute form, although at times it exists independent of or precedes an acute attack. It is characterized by the mildness of its symptoms, slow course, and moderate tissue changes. It may be present for a long time before any pathological lesions result, other than those found in the acute form, and when these changes do take place, they should rather be viewed as complications.

Chronic.

Chronic Laminitis is a term used by many to designate any of the sequelæ of the acute and sub-acute forms of this disease. *Pure* chronic inflammation of the laminæ is not very commonly met with, but is most frequent in horses that have long done fast track work. They have "fever in the feet" at all times and are continually sore, both conditions being aggravated by work. Like chronic inflammation of other parts there is a strong tendency here to the development of new connective tissue, which by its pressure upon the blood vessels interferes with nutrition. Atrophy of the os pedis and periostitis with caries is not unusual. The continued fever and impaired function of secretion, results in the production of horn, defi-

cient in elasticity, somewhat spongy in character and inclined to crumble. In others of these cases of "soreness" in horses used to hard work, there is evident weakness of the coats of the vessels brought on by repeated functional exhaustion. Here slight work acts as an exciting cause of congestion, which results in serous effusion and temporary symptoms similar to those of chronic Laminitis. Chronic inflammation of the laminæ is no doubt present in most of the sequelæ of Laminitis, but it is not the most important nor most interesting lesion, and so should be considered only as an adjunct of the processes it may accompany.

COMPLICATIONS.

Complications concurrent with or supervening upon Laminitis are frequent and varied, and are often dependent upon causes not fully understood.

Super-Purgation.

Super-purgation is one of the simplest of these, and not usually attended with dangerous consequences. It rarely occurs unless induced by the exhibition of a purgative; and the excessive action of the medicine is probably to be explained upon the theory that the mucous membrane sympathizes with the diseased laminæ, is irritable, and readily becomes over-excited. The discharges are thin and watery, sometimes offensively odorous, and occasionally persist in spite of treatment. It may prove disastrous to the welfare of the patient, by the rapid exhaustion which it causes, preventing resolution of the Laminitis, and may even cause death.

Septicæmia and Pyæmia.

Septicæmia or Pyæmia are unusual complications, and are seen only in the most severe cases, where bed-sores are present, or suppuration of the laminæ results. They die, as a rule, within three days after showing signs of the complication. A further consideration of the condition is unnecessary in this connection.

Metastatic Pneumonia.

PNEUMONIA—the so-called Metastatic—needs no especial consideration, for in its lesions and symptoms it does not differ from ordinary pneumonia, although it may be over-looked entirely by the practitioner. Examinations of the chest in Laminitis should be made every day, so as to detect the disease at its onset, and render proper aid.

Side-Bones.

A rapid development of side-bones, is one of the complications, or perhaps better, a sequel of Laminitis, not often met with in practice. Here the inflammatory process extends to the lateral cartilages with a strong tendency to calcification. The deposition of the lime-salts is sometimes most rapid, so that the "bones" are developed in a few weeks' time; in other instances they are deposited slowly, and their growth is not noted until long after the subsidence of the Laminitis, so that the exciting cause is not suspected. This change in the cartilages may commence as early as the first week of the Laminitis, and although the trouble in the laminæ is removed in the course of a fortnight, the symptoms do not entirely subside, the animal still retaining the shuffling gait, while the side bones continue to grow, and the patient usually remains quite lame. This alteration of the cartilages generally prevents the patient recovering his natural gait, because of the permanent impairment of function induced, and the practitioner receives unjust censure for a condition of affairs he could neither fore-see nor prevent.

The lamanitic process also occasionally extends to the periosteum of the os coronæ; or at least, concurrent with and subsequent to Laminitis the development of "low ring-bone" is seen, and it is apparently dependent upon the disease of the laminæ for its exciting cause. The impairment of function and consequent symptoms are much less marked here than in side-bones. The coronet remains hot and sensitive, and somewhat thickened after the Laminitis subsides, and a little lameness is present. This lameness persists and the deposits of new bone may readily be detected.

Suppuration.

Suppuration of the keratogenous membrane is a somewhat common complication, and even when present in its most limited form is always a serious matter ; but when it becomes extensive, and especially where the suppurative process extends to the periosteum, the results are apt to be fatal. When suppuration occurs the exudation does not appear to be excessive, but is rich in leucocytes, and seems to have caused a detachment of the sensitive tissues from the horn, prior to the formation of pus in some instances, while in others the tissues are still attached to the horn, and the suppuration takes place in the deeper tissues.

Limited suppurations may take place in any part of the sensitive tissues of the foot during Laminitis, and may ultimately be reabsorbed instead of being discharged upon the surface ; but generally the process begins in the neighborhood of the toe, and spreads backwards and upwards towards the coronet, where it is seen separating the horn from the coronary band at the quarters. At the same time it is spreading over the sole, and eventually the entire hoof is loosened, and finally sloughs away, leaving the tissues beneath entirely unprotected. If an examination of the keratogenous membrane is now carefully made, it will be found covered in greater part by pus and coagulated exudate; at some points newly-organized horn may be seen, while in others, and especially in the recently separated portions, extravasated blood intermingles with the pus.

In other instances, and these are generally the cases not considered unusually severe, the suppuration begins at the coronary band which we find greatly effused, and crowded with wandering cells and leucocytes. The suppuration extends but a short distance in the podophyllous tissue, yet serves to destroy the patient by separating the hoof from the coronary band upon which it depends for support and growth. In this form of the suppurative process, it is usually seen beginning in front ; for it is this part of the coronary band that is always most actively affected with inflammation, and consequently it is here that impairments first occur. Suppuration of the sensitive

sole, is more common than of the sensitive laminæ and coronary band. It is present, in the majority of cases, where there is a dropping of the os pedis, and in other instances where the effusion at this point is so great as to arrest the production of horn and uncover the sensitive tissues. Except when the result of injury, it begins at the toe and spreads backward, and if not relieved by opening the sole, escapes at the heel. Suppuration of the sole is much less serious than where present in other parts of the foot.

If the acute constitutional symptoms developed from this sloughing of the foot do not result in death, a new hoof of very imperfect horn may be developed after a time, but unless the animal is to be kept for breeding purposes alone, the foot will ever be useless for work, and death should relieve the suffering. When only the sole sloughs, recovery takes place with proper treatment.

Peditis.

This is the term which Williams applies to that serious complication of Laminitis where not only the laminæ, but the periosteum and the pedal bone are also the subjects of the inflammatory process. Neither is this all, for in some of these cases of peditis acute serous synovitis of the "coffin joint," is present, and where the tendency is to suppuration empyema of the joint. Where periostitis and ostitis complicate Laminitis, the exudation takes place in the keratogenous membrane in and beneath the periosteum, and in the bone tissue. A mild form of periostitis, in which the exudation is in the outer or looser layer of the periosteum only, is a more common condition than is recognized by practitioners generally ; and the intimate contiguity of structures is the predisposing cause, the disease either spreading from the original seat, or the complication occurs as one of the primary results of the exciting cause. In the severer cases where the exudate separates the periosteum from the bone, suppuration, gangrene, and superficial caries are common results. Where the plastic infiltration of the bone tissue is rapid, the blood supply is cut off by the consequent pressure upon the vessels in the Haversian canals, and necrosis of the os pedis ensues. Grave constitutional symptoms

mark these changes, and soon prove fatally exhaustive to the patient.

In the mild cases of Periostitis it is by no means easy to determine its presence positively, for there are no special symptoms by which it may be distinguished from pure Laminitis. In the majority of the acute cases, though, that show no signs of improvement by the fifth to seventh day, it is safe to suspect periostitis is present, particularly if the coronets are very hot, the pulse remaining full and hard, and the lameness acute. In the fortunately rare cases where the bone is affected with inflammation and suppuration, the agony of the patient is intense, he occupies the recumbent position almost continually, never standing for more than a few minutes at a time, suffers from the most careful handling of the affected feet, maintains a rapid pulse and respirations, high temperature, loss of appetite and great thirst. It is in these cases the patient continually grows worse, and the appearance of suppuration at the top of the hoof in about two weeks after the inception of the disease, proves the inefficiency of any treatment that may have been adopted, and the hopelessness of the case. These patients die usually between the tenth and twentieth days, either from exhaustion or pyæmic infection. In making *post-mortem* examinations of this condition, the os pedis will be found blocked in parts with the exudate thrown out from its numerous blood vessels. There is atrophy of the bony tissue surrounding the Haversian canals, and a development of connective tissue within, or else the enlarged canal is filled with suppuration. The contiguous surface is denuded of its periosteum, which has been detached by the free exudation, is darker in color than the healthy bone and generally roughened.

Caries.

Superficial caries may be present in, or follow, any case of Laminitis, and its most common seats are directly at the toe, particularly at the anterior surface, upon the anterior face just beneath the pyramidal process, and on the planter surface of the retroossal processes. In this last-named position it occasionally becomes more than superficial, extend-

ing deep into the bone which it honey-combs completely in the adjacent parts, and finally destroys, so that this part of the bone may be found crumbling to pieces on attempting to remove it.

Gangrene,

Occurs in the periosteum as the result of excessive detachment from the bone, combined with compression from an over-profuse exudate. Other parts of the sensitive tissues are subject to the same fate occasionally, from this last-named cause, and at times large territories will be found dead.

Pumiced Sole,

Is that condition in which the horny sole in the neighborhood of the toe readily crumbles away and leaves the sensitive tissues more or less exposed. It is not confined to being a complication of Laminitis, but may be seen whenever the necessary conditions for inducing it are present. Williams has described the horny tissue under these circumstances as being : "weak, cheesy, or spongy, like macerated horn, or even grumous," and this certainly conveys a good idea of its appearance and general characteristics. This crumbling horn when critically examined, shows almost an entire absence of the cohesive matter which unites the healthy horn fibres, while the fibres themselves are irregular and granular in appearance. Pumiced sole depends upon an impairment of the horn-secreting powers of the sensitive sole, or upon a separation occurring between the horny and soft tissues which maintain its vitality. The normal sole physiologically maintains a proper thinness, by crumbling off in scales as it passes beyond the life-mataining influence of the producing tissues, and anything which perverts, suspends, or destroys this influence, causes the crumbling process to become excessive.

Punctured wounds of the feet, where accompanied by any considerable destruction of the soft or horn-secreting tissues, present the same peculiarities in this respect, in the immediate neighborhood of the injury. Bruises of the sole are occasionally followed by this change in the horn, where the exudation has been excessive and separated it from the living tissues.

True in these cases we rarely see the soft tissues laid bare for the reason that new horn is constantly secreted and replaces that undergoing the process of disintegration.

Laminitis presents three different conditions under which pumiced sole may appear. First: where free exudation separates the horn from the other tissues, or where the process of inflammation arrests the production of horn, by impairing or destroying the horn-secreting membrane. Secondly: where depression of the os pedis causes pressure upon, and arrests the formation of horn ; and, Thirdly ; where the elevation of the sole compresses the soft tissues against the pedal bone and induces the same condition. Pumiced sole as it results from simple exudation and separation of tissues is of no importance, for the reason given above in connection with bruises ; but where suppuration occurs in restricted portions of the foot in conjunction with Laminitis, it always lays bare the tissues beneath and impairs the animal's value temporarily. In these cases recovery takes place after a few weeks time by the tissues horning over, as in injuries which have been attended with the same process. Depression of the os pedis is not a sufficient cause within itself to cause pumiced sole ; for, if the relative change in the bone takes place slowly, or if the horn is thin, the sole becomes convex from the gradual pressure, and the soft tissues adapt themselves to the change without having their function materially impaired. But when the dropping is sudden and the soft tissues entirely destroyed, the horn rapidly crumbles away and the toe of the bone comes through. In many of these cases the soft tissues remain uncovered for months, and when they eventually become covered, it is with a thin slightly adherent horn that bears but little or no wear. The sole being now convex, the diseased tissues are compelled to bear unusual weight by coming in contact with the ground, and hence it is these animals are generally incurable cripples. In the majority of cases where the sole is raised to meet the pedal bone, and pumiced sole occurs, it is due, not to pressure of the bone from within, (for the tissues are capable of adapting themselves to the gradual change) but to impaired vitality of the sensitive tissues from the inflammation, and the constant

concussion and pressure applied from without during progression. Added to this is to be considered the paring away of the horn by the smith when applying the shoe, thereby keeping the sole at this point too thin.

Turning Up of The Toe.

The results of my investigation into the cause and pathology of this, too frequent, and most interesting sequel of Laminitis are somewhat at variance with the explanations given by previous writers on the subject. For instance, Prof. Williams in his "Surgery" says : "In some cases the removal of the exudate leaves a space between the sensitive and horny laminæ, which has led some observers to think that the disease consists essentially of absorption of the bond of union between the two sets of laminæ, the formation of a cavity and the subsequent filling up of it with imperfect cheesy or seedy horn constituting what is termed seedy-toe. Should the inflammation persist, the exudate accumulates at the toe, increases in thickness, presses upon the toe of the os pedis in the one direction, and upon the crust in the other, separating the two, forcing the toe of the bone downwards, and the toe of the crust upwards. The effect of this change in the position of the bone is the formation of a convex sole." Prof. Law in his "Adviser" makes the following remarks in relation to this condition : "If the inflammation persists in a slight form, an excessive growth of soft spongy horn takes place in front of the laminæ at the toe, separating the coffin bone from the hoof-wall, and allowing its anterior border to press upon the sole, or even to perforate it." That "the removal of the exudate leaves a space between the sensitive and horny laminæ" is not clear to me, for I have never been able to find an *empty* space between the laminæ, no matter how far apart they may have been forced. It does not seem possible that such a condition could in any way be produced by resorption, for the opposition to be overcome in order to produce an empty space, a vacuum—is much greater than can be accomplished by the absorbents.

All reabsorption of effused material must be followed in subcutaneous parts, by one or more of four conditions : con-

traction of tissue, renewed effusion, replacement of displaced parts, or the production of new tissue.

So far as my observations have gone, I find the effusion under all circumstances in Laminitis comparatively limited, and, that as the effused material is absorbed, the parts regain their normal position and condition, or else the exudate is replaced by, or converted into, new tissue—so that at no time is there an empty space created in the structures of the foot. No matter how severe the inflammatory action may be, nor how profuse the exudation, unless suppuration occurs, the soft tissues are not destroyed to any considerable extent.

It is claimed by some writers that the soft tissues, having been separated by the exudate from the horn, have lost their function; and that new horn, formed so plenteously under certain conditions, is produced alone by the coronary band. We deny that this is true; for we find in all of these cases, where there is turning up of the toe, that the horn-producing function of the coronary band is greatly impaired—in some cases almost entirely suspended, upon the anterior part of the foot, and that the greater this impairment on the part of the coronary band the richer is the production of new horn at the toe. Furthermore, the new horn is always intimately attached to the podophyllous tissue beneath, by which it has unquestionably been produced; for if the coronary band is producing but little, and the old horn is but slowly growing off, whence comes this new horn? It cannot come from a tissue which can only replace old horn with new, the said tissue being at least two inches away from the point of production. Another evidence that the new horn comes from the podophyllous tissue, is, that when the function of the coronary band is regained, (as it oftentimes is), this new horn grows off with the wall and is replaced by new horn from above, or from the coronary band.

Furthermore, this new horn is arranged between the sensitive laminæ in plates similar to the arrangement of the horny laminæ in the normal foot, with the exception that they are not quite so regular and perfect in outline, and are covered with more of the free cells spoken of by Fleming. Regarding the direction of the horny fibres in this new horn, they will be

found more oblique than the fibres in the healthy wall, the producing tissue seeming to endeavor to throw these fibres off at somewhat an approach to a right angle, as seen in the sensitive sole and coronary band. Lastly these fibres are somewhat flexuous, as in the healthy frog.

At whatever time, during the progress of the disease, the separation of the sensitive and horny tissues is effected, the os pedis thereafter *tends* to alter its relative position by reason of the weight which it receives, and the position the animal assumes throwing all the strain on the flexors.

But this tendency amounts to nothing of importance, unless there is extensive separation of the bonds of union, when the consequent pressure upon the soft tissues of the sole, already impaired by disease, proves disastrous to their horn-producing function, and ultimately destroys their structure. As seen in plate No. 2, this deviation of the os pedis amounts to about five lines, the convexity of the sole, reaching four and a half lines. Here the change has been so gradual that but little impairment of the function of the sensitive sole has resulted; and the thinness of the horny sole in front of the frog, is due to the interference of the shoeing-smith. The space between the toe of the os pedis and the original horn-wall, has been filled in with new horn, as the bone receded from its original position. If this change in the relation of the bone to the other tissues, was due, as Williams claims, to pressure of the exudate, this pressure, to overcome the opposition of the sole, etc., would be so powerful as to impair the horn-secreting function of the podophyllous tissue on the anterior toe of the os pedis; and hence, we would find but little horn secreted, and that of a very inferior quality. The opposite are the facts—plenty of horn of a good quality. That replacement, complete or in part, takes place in many of these cases, cannot be denied, for, as the superfluous horn at the toe grows off with the wall, the bone tends to resume its old position.

The exudate plays no part whatsoever in *forcing* the toe of the os pedis downward, and the toe of the hoof upward, as claimed by Williams and Law.

It does not always even so much as cause the separation be-

tween the sensitive and horny tissues ; for at times this solution of continuity is dependent upon other causes which have no connexion with exudation. The turning up of the toe, as seen in plate No. 3, is only the result of a simple mechanical principle brought into operation by means of the altered relative growth of the horny fibres in different parts of the foot.

In *every one* of these cases there is a very decided impairment of horn production upon the part of the coronary band in its anterior part, while at the heel the production is as rapid, or even takes place more rapidly, than normal, and the inevitable result is the formation of an angle upon the anterior wall ; for the growing heel tends to revolve, in its growth, around the fixed point near the cornary band. As the angle forms at the point where the impairment of function exists, *i. e.*, near the coronary band, the horn-fibres are deflected forwards, and consequently upwards, so that the toe is brought nearer the horizontal line, and the angle formed by the bones of the leg with the anterior wall of the foot is diminished. This turning up of the toe does not take place suddenly, as it might if dependent upon the pressure of exudation, but the change is effected slowly, and is commensurate only with the proportionate impairment of horn secretion in front, and normal or increased production at the heel. If the secretion of horn is nowhere impaired, or if the interference with this function is equally distributed throughout the entire coronary band, then it matters not what amount of exudation may take place over the toe of the os pedis, the toe of horn does not and *cannot* turn up.

But when the necessary causes are in operation, and the angle begins to form on the anterior wall, the toe of the os pedis, with its soft tissues attached, is separated from the horny laminæ, and becomes pressed upon by the upraising sole. This separation of the tissues is due to the fact that the action of the flexor pedis perforans and the ligaments of the "coffin joint" tend strongly to hold the os pedis in its normal position, in relation to the other bones of the leg ; while the strongest opposition is offered to the toe accompanying the horn, by the articular base of the coffin bone, and especially the pyramidal eminence, being situated above the point of the new angle, there-

by necessitating the downward movement of all this part of the bone so that the toe might conform to the new line of angularity assumed by the lower anterior wall of the hoof.* The exudation which is now found taking place at the toe is the *result*, not the *cause*, of the separation of the sensitive from the non-sensitive tissues, and the new horn, which forms here, is the product of the neighboring podophyllous tissue.

As the toe of the horny box proceeds in its change of relative position, the sole rises to the os pedis, which eventually, by its pressure, causes convexity of the horny sole.

Animals affected with pumiced foot, and turning up of the toe, during progression, always place the abnormally-long heel first upon the ground, not because the heel is too long nor, as in acute or sub-acute Laminitis, to relieve the pain, but for the simple reason that the animal carries the leg forward with the column of bones in the normal position, and attempting to keep them so, the heel first comes in contact with the ground, and he then knuckles over at the fetlock, in proportion to the amount of foot deformity present, as he brings the toe to the surface.

The pain and impairment of function in these cases always results in marked atrophy of the muscles of the fore-arm, shoulder, and to some extent of the pectorals, while the position of the fore feet advances the scapulo-humeral joints so well forward as to cause a somewhat sunken appearance of the chest in front, which the laity recognize as a peculiar form of the disease which they have designated as "Chest Founder."

Regarding the presence of inflammation during this process, there is no doubt a chronic form is in existence a long time after these lesions commence, yet it may in time subside and leave the feet free from fever while the other changes still go on.

The lesions of turning up of the toe are permanent, and are withal, the most interesting, pathologically, of all the complications of Laminitis.

* Since writing the above, I have seen a case in which the angle formed directly at the coronary band, the os pedis being carried up, at the toe, with the horn, while the articular base was correspondingly depressed. The sole was of the normal thickness, and not in the least convex.

*Erosions of Encrusting Cartilage.*

The altered position of the os pedis, as related to the weight-bearing surface, is such that in time, the flexors are shortened, and the joints become permanently sub-luxated with accompanying degenerative process of the articular surfaces which end in large ulcers at the fetlock, the second, and sometimes the third, phalangeal articulations. These diseased conditions of the joints, add to the suffering of the animal and increase his difficulty of locomotion.

TREATMENT.

The treatment of Laminitis is probably more varied than in any other disease, and yet in spite of it a large number of cases recover for even the poorest practitioner. Since there are two objects to be attained in treatment—prevention and remedy—the matter will be considered under the head of prophylaxis and remedial medication.

Prophylaxis.

To guard against and prevent disease, or to render an unpreventable attack less serious than it otherwise would be, is the highest practice of the healing art. In a disease so prone to result from the simplest causes, as seen in Laminitis, and especially when the soundest judgment may not be able to determine the extent of the disease-resisting powers of the tissues which are liable to be affected, or of what shall in every instance constitute an over-excitement, it is not strange that authors have avoided this field of instruction, and that horse-owners find themselves in trouble from unintentional transgression. If the disease was dependent upon specific causes, or if the stability of the tissues was of a fixed or more nearly determinate quality, some measures might be instituted that would prove generally preventive. But when we recall the fact that predisposing causes are so prevalent, and often cannot be remedied; that what is but gentle work in one instance may incite disease in another; that what is food to-day may to-morrow prove disastrous to health, and that necessary medical inter-

ference, no matter how judicious, may cause a more serious complaint than that which was being treated, the obstacles to contend with become plain. Notwithstanding the difficulties besetting effective prophylaxis of this disease, there are some general rules to be observed that will in part serve to prevent the development of an unusual number of cases. In the first place, all the predisposing causes named, must be removed where possible, and when this is impossible, unusual care must be taken not to bring into operation an exciting cause. Fat animals should under no circumstances have hard work, and if the weather is warm, or the variation of temperature great, they should have but *slow, gentle* labor, until they become insured to it, the tissues hardened, and their excitability reduced to a minimum.

Green horses should always have moderate work for the same reason, and particularly when changed from the farm and dirt-roads to city pavements. The increased concussion, changed hygienic conditions and artificial living readily become active causes of the disease under these circumstances.

Army horses just out of winter-quarters, track-horses with insufficient preparation, and farmer's horses put to work in the Spring, are among the most susceptible classes, and must be protected by work that is easy and gradual. If long marches or drives are imperative, then the incumbrances must be as light as possible, and the journey interspersed with frequent rests ; for this allows the laminæ to regain their impaired functional activity, and thereby to withstand much more work without danger. And, furthermore, it permits an early detection of an oncoming attack in any case, prevents working after the disease begins and renders subsequent medication much more effective by cutting the process short at the stage of congestion.

All animals when resting immediately after work, should be protected from cold air or draughts. If placed in a stable that is warm and without draught, no covering is necessary—under opposite conditions blankets should be used until the excitement and exhaustion of the labor performed have entirely passed away. It is still better that all animals coming in warm

from work, be "cooled out" by slow walking until the perspiration has dried, and the circulation and respiration returned to the normal. Animals stopped on the road, even for a few moments' time, should always be protected from rapid change of temperature by appropriate clothing. If it can be avoided, horses that are working should never be driven or ridden through a stream or pool of water. Where necessary, they should be cooled off before passing through, and then kept exercising until completely dried. The same rule is to be observed with regards washing the legs in cold water, when the animal is just in from work; for although it is practiced extensively and usually with impunity, occasionally it proves the cause of a most acute attack of this disease. Regarding shoeing, as a predisposing cause, unusual changes in the manner of applying the shoe should not be hastily made.

If a plain shoe has been worn, high heels or toes must not be substituted at once, but the change, if necessary, gradually made, so that the different tissues may adapt themselves to the change of functional performance they are called upon to bear. If on the other hand such changes are imperative, as is sometimes the case, then the work must be so reduced in quantity and quality that it cannot prove excitant of the disease. Laminitis from the effects of purgative medicines is a condition which can scarce be effectively guarded against, unless we discard entirely this useful class of medicines. I cannot determine from the few cases in which I have seen this unhappy result of a purgative, that there are any conditions of the system present that would warn us of danger in this direction. The disease does not seem to have any dependence, for inception, in such cases upon the size of the purgative, the length of time before purgation begins, or the activity and severity with which the remedy acts. The extent of prophylaxis in this regard, must be confined to the exhibition of moderate doses of medicines known to have unusual irritating effects on the alimentary canal. They should be used only when necessity demands it.

Experience alone will determine what animals are liable to suffer from this disease through the influence of the different

aliments. When an attack can with any certainty be ascribed to any particular food, it should ever be withheld unless in the smallest quantities. Horses that have never been fed upon Indian Corn, should receive but a little at a time at first, and always mixed with bran, oats or other food, until it has been determined that no danger exists. Corn is much more liable to cause Laminitis in warm than in cold weather, and for this reason it should always be fed with care during Spring and Summer months. Against Metastatic Laminitis there are no measures which can in any way prove preventive, the important consideration being its early recognition, which is more readily accomplished than in Metastatic Pneumonia concurrent with Laminitis.*

When an animal is excessively lame in one foot, the other or opposite member should have the shoe early removed, and cold water frequently applied. At the same time the slings should be used if the subject remains standing. Horses should under no circumstances be over-worked: to guard against this previous work, nature of roads, state of weather, and various other influences must be carefully noted. Watering while warm, is a pernicious habit, and unless the animal is accustomed to it, is apt to result in some disorder—oftimes in Laminitis.

Remedial Medication.

In those cases of simple passive congestion of the laminæ the body should be warmly clothed, and warm drinks given to draw the blood in increased quantity to these parts, so as to direct it from the feet; at the same time the feet should be placed in warm water so as to increase the return flow of blood. In the course of half an hour the feet may be changed to cold water, which serves as a tonic to all the tissues, and kept there until recovery is completed. If the constitutional symptoms demand it diuretics should be given. Half-ounce doses of nitre three times a day in the water answers the purpose. In cases of active congestion the warm foot-baths should be omitted, and

* I have omitted speaking of Parturient Laminitis, never having seen a case, and am unacquainted with appropriate prophylaxis.

cold ones substituted from the commencement. Sub-acute Laminitis demands the same treatment, with laxatives if there is constipation, and the addition of low-heeled shoes. The diuretics may need to be continued for some time, and their frequency increased. Regarding Acute Laminitis, what has been called the "American Treatment" is so simple, and withal so efficient that it is to be remarked other countries have never adopted it. Since the disease is a local one, unquestionably the remedies used should be applied in the immediate neighborhood of the affected parts, or, if drugs are administered internally, they should have some specific localized action.

And such are the claims made for the above-named method of treatment. It consists solely in the exhibition of large doses of Nitrate of Potash and the continued application to the feet and ankles, of cold water. We have never been able to determine that nitre had any action on the keratogenous membrane in particular, either in health or in disease, and if it is to be called a specific, the claim must, as yet, rest upon the fact that it nearly always cures. One noted American veterinary surgeon attributes its good results, in this disease, to its conceded power of defibrinizing the blood; yet if this were its only action, any remedy producing the same effect in the same degree, should prove just as effectual as a remedy; a conclusion which practice does not sustain. On the other hand, if Nitre has but the one action as claimed, the remedies inducing the *opposite* condition would be contra-indicated; yet phlebotomy, which is known to favor hyperinosis, is practiced by some good practitioners in Laminitis, and as they claim, with the best of results. But be its action what it may, the fact remains that *three to four-ounce* doses of Nitre repeated every *six* hours is attended with the happiest effects; the Laminitis frequently subsiding inside of a week's time. These large doses may be continued for a week or ten days' time without danger; never under any circumstances have I seen the kidneys irritated to excess, or other unfavorable effects produced.

The feet should either be kept in a tub of water at a temperature of 45° to 50° F.; (it may be lowered if desired), or if the animal is lying down, swabs should be used and wet every

half hour with the cold water. The water not only keeps the horn soft and moist, but acts directly upon the inflamed tissues by reducing their temperature, thereby increasing their vitality and disease-resisting qualities, and at the same time, by toning up the coats of the blood vessels, diminishes the supply of blood and limits the exudation. Furthermore, cold has also an æsthetic effect upon the diseased tissues, and relieves the pain.

Aconite may be given in conjunction with Nitre where the heart is greatly excited, and is beating strongly. Ten-drop doses repeated every two hours for twenty-four hours, is usually sufficient. The practice of giving cathartics is dangerous, for it may excite super-purgation. Usually the Nitre has sufficient effect upon the constipation to relieve it, yet if it should prove obstinate, laxatives may be carefully given. Bleeding, both general and local, should be guarded against ; the first because of unfavorable hyperinosis, the latter from the danger of suppuration and the difficulty in securing healing in some cases. The shoes should always be early removed, and the soles left unpared.

Paring of the soles presents two objections—first, while it may temporarily relieve the pain by relieving pressure, it at the same time allows of greater exudation which may more than counter-balance the good effects : secondly, it makes the feet tender and subject to bruises when the animal again goes to work. The shoes should be replaced when convalescence sets in, and the animal ready to take exercise. Exercise should never be enforced until the inflammation has subsided, for although it temporarily relieves the pain and soreness, it serves to maintain the tissues in a state of continued irritation, increases the exudation, and prolongs the recovery.

If, at the end of the fifth or sixth day, prominent symptoms of recovery are not apparent, apply a stiff blister of cantharides around the coronet and omit the nitre for about forty-eight hours. As soon as the blister has drawn well, the feet may again receive wet swabs. If one blister does not suffice to remove the soreness, as is the case sometimes, especially where periostitis is present, it may be repeated, or the actual cautery applied. The same treatment should be adopted

where side-bones form or periostitis of the os coronæ ensues. When the sole breaks through and exposes the os pedis and soft tissues, the feet must be carefully shod—with thin heels and thick toe where there is any tendency to walking on the heels—and the sole well protected with appropriate dressing and pressure over the exposed parts. When there is turning up of the toe, blistering of the coronet in front, carefully avoiding the quarters and heels, sometimes stimulates the growth of horn, but as a rule judicious shoeing is the only treatment that will keep the animal in a condition to do moderate slow work.

Where suppuration of the laminæ is profuse, it is better to destroy your patient at once and relieve his suffering ; but if the suppuration is limited to a small extent of tissue, especially of the sole, treatment as in acute cases may induce recovery, and should always be tried. If from bed-sores or other causes Septicæmia or Pyæmia is feared, the Bisulphite of Soda in half-ounce doses may be given in conjunction with tonics and other treatment indicated in these diseases. Regarding enforced recumbency, I doubt the propriety of insisting on it in the majority of cases, for I think, as a rule, the animal assumes whatever position gives most comfort. There can be no doubt that recumbency diminishes the amount of blood sent to the feet, and that the suffering is greatly relieved while in this position, so that the experiment of enforcing recumbency may be tried, yet should not be renewed if the patient thereafter persists in standing.

Where the animal stands, or where constant lying indicates it to prevent extensive sores, the patient should be placed in slings, and the weight supported in this manner to the relief of the feet. When all four feet are affected, it may be impossible to use slings, for the reason that the patient refuses to support any of his weight on his feet, and simply hangs in the slings. Lastly, convalescent cases must not be returned to work too early, else permanent recovery may never be effected.



FIG. 1.

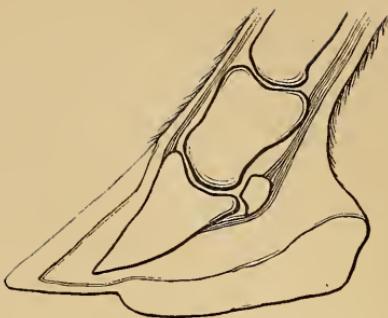


FIG. 2.

FIG. 1 shows the healthy foot, with all the tissues in normal relative position, as found in an eight-year-old gelding destroyed for dissection. The other cuts are in outline only.

FIG. 2 shows the changed position of the os pedis, as seen in a laminitic-foot in the Museum of the American Veterinary College. Downward deflection of the bone at the toe, 5 lines. Convexity of the sole, $4\frac{1}{2}$ lines. New horn formed on the anterior wall, as the bone receded, and fills the space between the present *sensitive* and original *horny* laminæ. Sole greatly thinned from paring. No turning up of the toe.



FIG. 3.

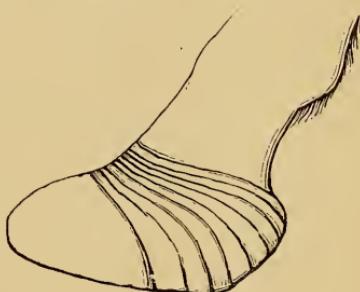


FIG. 4.

FIG. 3.—Chronic Laminitis, with turning up of the toe, from a specimen in American Veterinary College Museum. Deflection downward, 4 lines. Elevation of horny toe from original position, 7 lines. Development of sole beneath the navicular, from 7 lines (normal average thickness at this point) to 14 lines. Thickness of sole over toe of os pedis, $4\frac{1}{2}$ lines, (normal about 6 lines). Thickness of new horn over the anterior surface of the os pedis, 11 lines. Horn-producing function of the coronary band greatly impaired in front—heel too long.

FIG. 4.—External appearance of the same foot as Fig. 3, showing the irregularity of the lines produced by the alteration in relative horn growth at different points, and showing the angle on the anterior wall.



